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02/17/04
Date of Signature

PATENT
#03-0053-UNI
Case #C4252(C)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Burrows et al.

Serial No.: 10/699,996

Filed: November 3, 2003

For: LAUNDRY DETERGENT COMPOSITION

Edgewater, New Jersey 07020
February 13, 2004

SUBMISSION OF PRIORITY DOCUMENT

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

Pursuant to rule 55(b) of the Rules of Practice in Patent Cases, Applicant(s) is/are submitting herewith a certified copy of the United Kingdom Application No. 0225668.3 filed November 4, 2002, and United Kingdom Application No. 0319025.3 filed August 13, 2003, upon which the claim for priority under 35 U.S.C. § 119 was made in the United States.

It is respectfully requested that the priority document be made part of the file history.

Respectfully submitted,

Rimma Mitelman
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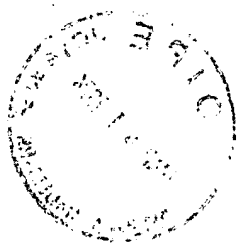

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05NOV02 E760844-7 002898
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Request for grant of a patent

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)

1. Your reference — C4252 (C)/rkk

2. Patent application number *(The Patent Office will fill in this part)* — 0225668.3 — - 4 NOV 2002

3. Full name, address and postcode of the or of each applicant *(underline all surnames)*

UNILEVER PLC
UNILEVER HOUSE, BLACKFRIARS
LONDON, EC4P 4BQ

Patents ADP number *(if you know it)* ~~50426956002~~ 1628002

If the applicant is a corporate body, give the country/state of its incorporation — UNITED KINGDOM

4. Title of the invention — LAUNDRY DETERGENT COMPOSITION

5. Name of your agent *(if you have one)* — Peter William Elliott. ~~FRANSELLA ME~~

"Address for Service" in the United Kingdom to which all correspondence should be sent *(including the postcode)*

PATENT DEPARTMENT, UNILEVER PLC
COLWORTH HOUSE, SHARNBROOK
BEDFORD, MK44 1LQ

Patents ADP number *(if you know it)* 1628003

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and *(if you know it)* the or each application number

Country	Priority application number *(if you know it)*	Date of filing *(day / month / year)*

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application	Date of filing *(day/month/year)*

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a) any applicant named in part 3 is not an inventor, or
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Request for preliminary examination and search *(Patents Form 9/77)*	1
Request for substantive examination *(Patents Form 10/77)*	
Any other documents *(please specify)*	

11. I/We request the grant of a patent on the basis of this application.

Signature(s) Date: 4TH Nov 02

Sandra Jane EDWARDS, Authorised Signatory

12. Name and daytime telephone number of person to contact in the United Kingdom **Ravinder K Kundra 01234 222439**

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Laundry Detergent Composition

TECHNICAL FIELD

The present invention relates to laundry detergent compositions containing a combination of anionic and specified nonionic surfactants giving improved stain removal.

BACKGROUND OF THE INVENTION

Laundry detergent compositions have for many years contained anionic sulphonate or sulphate surfactant, for example, linear alkylbenzene sulphonate (LAS), together with ethoxylated alcohol nonionic surfactants. Examples abound in the published literature. Conventional ethoxylated alcohol nonionic surfactants used in laundry detergent compositions are typically C_{10}-C_{16} alcohols having an average degree of ethoxylation of 3 to 8.

Agglomeration of insoluble complexes of calcium in hard water due to the reaction of calcium ions with the anionic surfactant is a well known problem, which is usually avoided by the use of a builder, such as STP, which removes calcium ions from the wash liquor. Without builder, detergency performance falls significantly as water hardness increases.

It has now surprisingly been found that the combination of anionic surfactant with nonionic surfactants having high HLB values, can give enhanced stain removal at a wide range of water hardnesses, especially at high water hardness, even when no builder is present.

PRIOR ART

WO 02 48297A (Unilever) discloses a built laundry detergent composition containing a combination of anionic, a highly ethoxylated nonionic (20 to 50 EO) and cationic surfactants, and 10 to 80 wt % of detergency builder.

WO 94 16052A (Unilever) discloses high bulk density laundry powders based on LAS and conventional nonionic surfactants, and containing small amounts of very highly ethoxylated alcohols, e.g. tallow alcohol 80EO, as a dissolution aid, also containing 5 to 80 wt % of a detergency builder.

WO 93 02176A (Henkel) discloses the use of highly ethoxylated aliphatic alcohols as "structure breakers" in high bulk density powders containing conventional nonionic surfactants and at least 10 wt % of zeolite.

EP 293 139A (Procter & Gamble) discloses twin-compartment sachets containing detergent powders. Some powders contain very small amounts of tallow alcohol 25EO and 15 to 90 wt % builder materials.

US 4 294 711 (Procter & Gamble) discloses a textile softening heavy duty built detergent composition containing 1 wt% of tallow alcohol 80EO and 10 to 80 wt % of builder.

DEFINITION OF THE INVENTION

According to a first aspect of the invention, there is provided a laundry detergent composition comprising

(i) from 5 to 40 wt %, preferably from 7 to 30 wt %, of an anionic surfactant,

(ii) from 1 to 10 wt %, preferably from 2 to 6 wt % of a nonionic surfactant having a hydrophilic/lipophilic balance (HLB) value of from 13 to 25, preferably 15 to 22, most preferably 16 to 22,

(iii) optionally from 0 to 50 wt % of a cationic surfactant,

(iv) optionally from 0 to less than 10 wt % of a detergency builder,

(v) optionally from 0 to 60 wt % of at least one inorganic non-builder salt, and

(vi) optionally other detergent ingredients to 100 wt %.

According to a second aspect of the invention, there is provided a process for laundering textile fabrics by machine or hand, which includes the step of immersing the fabrics in a wash liquor comprising water in which a laundry detergent composition as defined in the previous paragraph is dissolved or dispersed.

According to a third aspect of the invention, there is provided a use of a nonionic surfactant having a hydrophilic/lipophilic balance (HLB) value of from 13 to 25, preferably 15 to 22, most preferably 16 to 22, to improve the stain removal of laundry detergent compositions as previously defined.

DETAILED DESCRIPTION OF THE INVENTION

The detergent composition of the invention contains a combination of an anionic surfactant, a defined nonionic surfactant of high hydrophilic/lipophilic balance (HLB) value, optionally a cationic surfactant, optionally a limited amount of detergency builder and optionally at least one inorganic non-builder salt. Further optional detergent ingredients may also be present.

Detergent compositions according to the invention show improved stain removal across a range of fabrics and water hardnesses.

The anionic surfactant (i)

Anionic surfactants are well-known to those skilled in the art. Many suitable detergent-active compounds are available and are fully described in the literature, for example, in "Surface-Active Agents and Detergents", Volumes I and II, by Schwartz, Perry and Berch.

Examples include alkylbenzene sulphonates, primary and secondary alkylsulphates, particularly C_8-C_{15} primary alkyl sulphates; alkyl ether sulphates; olefin sulphonates, preferably alpha olefin sulphonates; alkane sulphonates; alkyl xylene sulphonates; dialkyl sulphosuccinates; and fatty acid ester sulphonates. Also suitable are ether sulphates, especially sodiumlaurylether sulphate (SLES). Sodium salts are generally preferred.

The anionic surfactant is preferably a sulphonate or sulphate anionic surfactant. More preferably the anionic surfactant is linear alkylbenzene sulphonate or primary alcohol sulphate. Most preferably the anionic surfactant is linear alkylbenzene sulphonate.

The anionic surfactant is present in an amount of from 5 to 40 wt %, preferably from 7 to 30 wt %, based on the weight of the total composition.

The nonionic surfactant (ii)

The nonionic surfactant is any nonionic surfactant having a hydrophilic/lipophilic balance (HLB) value of from 13 to 25, preferably 15 to 22, most preferably 16 to 22.

HLB values can be calculated according to the method given in Griffin, J. Soc. Cosmetic Chemists, 5 (1954) 249-256.

For example, the HLB of a polyethoxylated primary alcohol nonionic surfactant can be calculated according to the following formula:

$$HLB = \frac{MW(EO)}{MW(Tot) \times 5} \times 100$$

where,

MW(EO) = the molecular weight of the hydrophilic (ethoxy) part

MW(Tot) = the molecular weight of the whole surfactant molecule

Nonionic surfactants suitable for use in the invention are preferably those having a large polar head group and a hydrocarbyl chain. For the sake of clarity, the polar head group should have hydrophilic character and the hydrocarbyl chain should be of hydrophobic character. Preferably, the large polar head group contains a hydrophilic repeating unit.

The nonionic surfactant (ii) is preferably an alkoxylated alcohol nonionic surfactant.

Especially preferred alkoxylated alcohols are those having a Hydrophilic/Lipophilic Balance (HLB) value in the range of from 15 to 20, preferably 16 to 18.

The compositions of the invention are preferably free from nonionic surfactants other than the defined nonionic surfactant (ii) described above.

The nonionic surfactant is suitably present in an amount of from 1 to 20 wt %, preferably from 1 to 10, most preferably from 2 to 6 wt %, based on the weight of the total composition.

In the compositions of the invention, the weight ratio of the anionic surfactant (i) to the nonionic surfactant (ii) is within the range of from 0.25:1 to 40:1, suitably 1:1 to

15:1, preferably from 1:1 to 10:1 and most preferably from 2:1 to 6:1.

Nonionic surfactant (ii) - alkoxylated alcohols

Examples of alkoxylated alcohols suitable for use as nonionic surfactant (ii) in the present invention include the condensation products of aliphatic (C_8 - C_{20}, preferably C_8 - C_{16}) primary or secondary linear or branched chain alcohols or phenols with alkylene oxides, preferably ethylene oxide or propylene oxide, most preferably ethylene oxide, and generally having from 20 to 80, preferably 20 to 50 alkylene oxide groups. For the sake of clarity, the alkylene oxide group is the hydrophilic repeating unit.

According to an especially preferred embodiment of the invention, the nonionic surfactant is an ethoxylated aliphatic alcohol of the formula (I):

$$R - (- O - CH_2 - CH_2)_n - OH \qquad (I)$$

wherein R is a hydrocarbyl chain having from 8 to 16 carbon atoms, and the average degree of ethoxylation *n* is from 20 to 50.

The hydrocarbyl chain, which is preferably saturated, preferably contains from 10 to 16 carbon atoms, more preferably from 12 to 15 carbon atoms. In commercial materials containing a spread of chain lengths, these figures represent an average.

The alcohol may be derived from natural or synthetic feedstock. Preferred alcohol feedstocks are coconut, predominantly C_{12}-C_{14}, and oxo C_{12}-C_{15} alcohols. Longer chain materials such as tallow or hardened tallow (C_{18}) are not preferred.

The average degree of ethoxylation ranges from 20 to 50, preferably from 25 to 40. A value of around 30 is especially preferred.

Preferred materials have an average alkyl chain length of C_{12}-C_{16} and an average degree of ethoxylation of 25 to 40.

An example of a suitable commercially available material is Lutensol (Trade Mark) AO30, ex BASF, which is a C_{13}-C_{15} alcohol having an average degree of ethoxylation of 30.

The compositions of the invention may contain non-ionic surfactants other than the defined nonionic surfactant (ii) described above. Preferably, however, the compositions of the invention are free from nonionic surfactants other than the defined nonionic surfactant (ii).

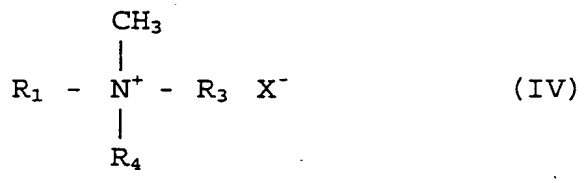
The optional cationic surfactant (iii)

Preferred water-soluble cationic surfactants are quaternary ammonium salts of the general formula III

$$R_1R_2R_3R_4N^+ X^- \qquad \text{(III)}$$

wherein R_1 is a relatively long (C_8-C_{18}) hydrocarbyl chain, typically an alkyl, hydroxyalkyl or ethoxylated alkyl group, optionally interrupted with a heteroatom or an ester or amide group; each of R_2, R_3 and R_4 (which may be the same or different) is a short-chain (C_1-C_3) alkyl or substituted alkyl group; and X is a solubilising anion, for example a chloride, bromide or methosulphate ion.

A preferred cationic surfactant is a quaternary ammonium compound of the formula II in which R_1 is a C_8-C_{18} alkyl group, more preferably a C_8-C_{10} or C_{12}-C_{14} alkyl group, R_2 is a methyl group, and R_3 and R_4, which may be the same or different, are methyl or hydroxyethyl groups. Such compounds have the formula IV:



(IV)

In an especially preferred compound, R_1 is a C_{12}-C_{14} alkyl group, R_2 and R_3 are methyl groups, R_4 is a 2-hydroxyethyl group, and X^- is a chloride ion. This material is available commercially as Praepagen (Trade Mark) HY from Clariant GmbH, in the form of a 40 wt% aqueous solution.

Other classes of cationic surfactant include cationic esters (for example, choline esters).

The cationic surfactant is optionally present in an amount of from 0 to 50 wt %, preferably 5 to 40 wt %, most preferably 11 to 35 wt %.

The optional detergency builder (iv)

The compositions of the invention may contain a detergency builder. Preferably the builder is present in an amount of from 0 to less than 10 wt % based on the weight of the total composition. More preferably the amount of builder does not exceed 5 wt %. Most preferably, the compositions are essentially free of detergency builder.

The builder may be selected from strong builders such as phosphate builders, aluminosilicate builders and mixtures thereof. However, strong builders are preferably present in an amount not exceeding 5 wt %, and most preferably strong builders are absent. One or more weak builders such as calcite/carbonate, citrate or polymer builders may be additionally or alternatively present.

The phosphate builder (if present) may for example be selected from alkali metal, preferably sodium, pyrophosphate, orthophosphate and tripolyphosphate, and mixtures thereof.

The aluminosilicate (if present) may be, for example, selected from one or more crystalline and amorphous aluminosilicates, for example, zeolites as disclosed in GB 1 473 201 (Henkel), amorphous aluminosilicates as disclosed in GB 1 473 202 (Henkel) and mixed crystalline/amorphous

aluminosilicates as disclosed in GB 1 470 250 (Procter & Gamble); and layered silicates as disclosed in EP 164 514B (Hoechst

The alkali metal aluminosilicate may be either crystalline or amorphous or mixtures thereof, having the general formula: 0.8-1.5 Na_2O. Al_2O_3. 0.8-6 SiO_2.

These materials contain some bound water and are required to have a calcium ion exchange capacity of at least 50 mg CaO/g. The preferred sodium aluminosilicates contain 1.5-3.5 SiO_2 units (in the formula above). Both the amorphous and the crystalline materials can be prepared readily by reaction between sodium silicate and sodium aluminate, as amply described in the literature. Suitable crystalline sodium aluminosilicate ion-exchange detergency builders are described, for example, in GB 1 429 143 (Procter & Gamble). The preferred sodium aluminosilicates of this type are the well-known commercially available zeolites A and X, and mixtures thereof.

The zeolite may be the commercially available zeolite 4A now widely used in laundry detergent powders. However, according to a preferred embodiment of the invention, the zeolite builder incorporated in the compositions of the invention is maximum aluminium zeolite P (zeolite MAP) as described and claimed in EP 384 070A (Unilever). Zeolite MAP is defined as an alkali metal aluminosilicate of the zeolite P type having a silicon to aluminium ratio not exceeding 1.33, preferably within the range of from 0.90 to 1.33, and more preferably within the range of from 0.90 to 1.20.

Especially preferred is zeolite MAP having a silicon to aluminium ratio not exceeding 1.07, more preferably about 1.00. The calcium binding capacity of zeolite MAP is generally at least 150 mg CaO per g of anhydrous material.

The optional inorganic non-builder salt (v)

The compositions of the invention may primarily contain up to 60, preferably from 1 to 40 wt % of at least one inorganic non-builder salt, based on the weight of the total composition. These are included in order to increase detergency and ease processing.

Suitable inorganic non-builder salts include alkaline agents such as alkali metal, preferably sodium, carbonates, silicates, metasilicates etc, which for the purposes of this specification, are not to be considered as builders. A preferred alkali metal carbonate is sodium carbonate. Sodium carbonate may suitably be present in amounts ranging from 1 to 60 wt %, preferably from 2 to 40 wt %, based on the weight of the total composition. However, compositions containing little or no sodium carbonate are also within the scope of the invention. Further suitable inorganic non-builder salts include sodium bicarbonate and sodium sesquicarbonate and double salts such as sodium sulphate/sodium carbonate, e.g. burkeite.

Further examples of inorganic non-builder salts include sodium sulphate, sodium silicate, sodium chloride, calcium chloride and magnesium chloride, preferably calcium chloride and magnesium chloride, most preferably calcium chloride.

The other optional detergent ingredients (vi)

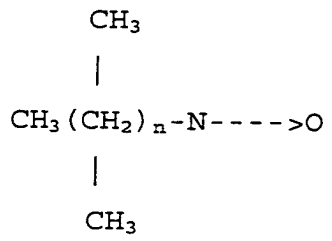
As well as the surfactants and builders discussed above, the compositions may optionally contain other active ingredients to enhance performance and properties.

The detergent compositions of the invention may comprise one or more optional ingredients selected from soap, peroxyacid and persalt bleaches, bleach activators, sequestrants, cellulose ethers and esters, cellulosic polymers, other antiredeposition agents, sodium sulphate, sodium silicate, sodium chloride, calcium chloride, sodium bicarbonate, other inorganic salts, fluorescers, photobleaches, polyvinyl pyrrolidone, other dye transfer inhibiting polymers, foam controllers, foam boosters, acrylic and acrylic/maleic polymers, proteases, lipases, cellulases, amylases, other detergent enzymes, citric acid, soil release polymers, fabric conditioning compounds, coloured speckles, and perfume. This list is not intended to be exhaustive.

Yet other materials that may be present in detergent compositions of the invention lather control agents or lather boosters as appropriate; dyes and decoupling polymers.

Suitable lather boosters for use in the present invention include cocamidopropyl betaine (CAPB), cocomonoethanolamide (CMEA) and amine oxides.

Preferred amine oxides are of the general form:-



where, n is from 7 to 17.

A suitable amine oxide is Admox (Trademark) 12, supplied by Albemarle.

Bleaches

Detergent compositions according to the invention may suitably contain a bleach system. The bleach system is preferably based on peroxy bleach compounds, for example, inorganic persalts or organic peroxyacids, capable of yielding hydrogen peroxide in aqueous solution. Suitable peroxy bleach compounds include organic peroxides such as urea peroxide, and inorganic persalts such as the alkali metal perborates, percarbonates, perphosphates, persilicates and persulphates. Preferred inorganic persalts are sodium perborate monohydrate and tetrahydrate, and sodium percarbonate. Especially preferred is sodium percarbonate having a protective coating against destabilisation by moisture. Sodium percarbonate having a protective coating comprising sodium metaborate and sodium silicate is disclosed in GB 2 123 044B (Kao).

The peroxy bleach compound is suitably present in an amount of from 5 to 35 wt%, preferably from 10 to 25 wt%.

The peroxy bleach compound may be used in conjunction with a bleach activator (bleach precursor) to improve bleaching action at low wash temperatures. The bleach precursor is suitably present in an amount of from 1 to 8 wt%, preferably from 2 to 5 wt%.

Preferred bleach precursors are peroxycarboxylic acid precursors, more especially peracetic acid precursors and peroxybenzoic acid precursors; and peroxycarbonic acid precursors. An especially preferred bleach precursor suitable for use in the present invention is N,N,N',N'-tetracetyl ethylenediamine (TAED). Also of interest are peroxybenzoic acid precursors, in particular, N,N,N-trimethylammonium toluoyloxy benzene sulphonate.

A bleach stabiliser (heavy metal sequestrant) may also be present. Suitable bleach stabilisers include ethylenediamine tetraacetate (EDTA) and the polyphosphonates such as Dequest (Trade Mark), EDTMP.

Enzymes

The detergent compositions may also contain one or more enzymes. Suitable enzymes include the proteases, amylases, cellulases, oxidases, peroxidases and lipases usable for incorporation in detergent compositions.

In particulate detergent compositions, detergency enzymes are commonly employed in granular form in amounts of from about

0.1 to about 3.0 wt %. However, any suitable physical form of enzyme may be used in any effective amount.

Other

Antiredeposition agents, for example cellulose esters and ethers, for example sodium carboxymethyl cellulose, may also be present.

The compositions may also contain soil release polymers, for example sulphonated and unsulphonated PET/POET polymers, both end-capped and non-end-capped, and polyethylene glycol/polyvinyl alcohol graft copolymers such as Sokolan (Trade Mark) HP22. Especially preferred soil release polymers are the sulphonated non-end-capped polyesters described and claimed in WO 95 32997A (Rhodia Chimie).

Powder flow may be improved by the incorporation of a small amount of a powder structurant, for example, a fatty acid (or fatty acid soap), a sugar, an acrylate or acrylate/maleate copolymer, or sodium silicate. One preferred powder structurant is fatty acid soap, suitably present in an amount of from 1 to 5 wt%, based on the weight of the total composition.

Form of the composition

The compositions of the invention may be of any suitable physical form, for example, particulates (powders, granules, tablets), liquids, pastes, gels or bars.

According to one especially preferred embodiment of the invention, the detergent composition is in particulate form. The composition can be formulated for use as hand wash or machine wash detergents.

Preparation of the compositions

The compositions of the invention may be prepared by any suitable process.

Suitable processes for the production of compositions in powder form include:

(1) drum drying of principal ingredients, optionally followed by granulation or postdosing of additional ingredients;

(2) non-tower granulation of all ingredients in a high-speed mixer/granulator, for example, a Fukae (Trade Mark) FS series mixer, preferably with at least one surfactant in paste form so that the water in the surfactant paste can act as a binder;

(3) non-tower granulation in a high speed/moderate speed granulator combination, thin film flash drier/evaporator or fluid bed granulator.

Powders of low to moderate bulk density may be prepared by spray-drying a slurry, and optionally postdosing (dry-mixing) further ingredients. "Concentrated" or "compact" powders may be prepared by mixing and granulating processes,

for example, using a high-speed mixer/granulator, or other non-tower processes.

Tablets may be prepared by compacting powders, especially "concentrated" powders.

Liquid detergent compositions may be prepared by admixing the essential and optional ingredients in any desired order to provide compositions containing the ingredients in the requisite concentrations.

The choice of processing route may be in part dictated by the stability or heat-sensitivity of the surfactants involved, and the form in which they are available.

In all cases, ingredients such as enzymes, bleach ingredients, sequestrants, polymers and perfumes may be added separately.

EXAMPLES

The invention will now be further illustrated by the following, non-limiting Examples, in which parts and percentages are by weight.

Table A: Materials used in the examples.

Chemical	Active level	Trade Name	Supplier
sodium carbonate	100	light soda ash	Ellis & Everard
sodium silicate	50	Crystal range	Ineos Silicas
linear alkylbenzene sulphonate (LAS) **	98	*Petralab 550	Petresa
sodium tripolyphosphate (STP)	100	*Empiphos	Albright & Wilson
nonionic ethoxylated alcohol, 7EO, C13-C15 EO = 11.8	100	*Synperonic A7	*Uniqema
nonionic ethoxylated alcohol, 30EO, C13-C15 EO = 17.2	100	*Lutensol AO30	*BASF

* Trade Mark

** neutralised to the sodium salt with NaOH

Example 1 - Preparation of laundry compositions

Comparative examples A and B (i.e. not according to the invention), and Example 1 were prepared according to Table 1 below.

Table 1:

Component	weight %		
	A	B	1
LAS	21	21	19.7
nonionic, 7EO, C13-C15	1.4	1.4	-
nonionic, 30EO, C13-15	-	-	4.9
STP	34.5	-	-
Sodium Carbonate	9.84	9.84	9.84
Sodium Silicate	4.92	4.92	4.92
demineralised water	to 100	to 100	to 100

Example 2 - Evaluation of laundry compositions: Removal of soil from cotton

The test cloths used were cotton and 10 cm x 10 cm in size.

The soils used were:

Kitchen grease: soya bean oil (chosen as a typical greasy kitchen soil), coloured with a violet dye (0.08 wt%) to act as a visual indicator.

Dirty engine oil: EMPA 102 test cloth, supplied by EMPA testmaterials, St. Gallen, Switzerland.

Butter: EMPA 102 test cloth, supplied by EMPA testmaterials, St. Gallen, Switzerland.

For the kitchen grease, the cloth was soiled with 0.5 ml of the soil. The dirty engine oil and butter soils were present on the EMPA 102 test cloth.

Stain removal was assessed by washing the soiled test cloths with the detergent compositions given in Table 1 in a Brazilian Brasstemp washing machine on half load cycle, which gave the following conditions:

Table 2:

Temperature	about 25 °C
Liquor to cloth ratio	27:1
Product dosage	2.0 g/l
Soak time	26.5 min
Wash time (agitation)	11.0 min
Rinse	1 X 6.0 min

The water used was of a range of hardnesses.

The reflectance ΔE, indicative of total colour change across the whole visible spectrum, of each test cloth was measured before and after the wash. The results, expressed as the difference ΔΔE between reflectance values ΔE before and after the wash, are shown in the following table.

Table 3: ΔΔE for stain removal from cotton by Example 1 (according to the invention) and Comparative Examples A and B (not according to the invention).

	kitchen grease			**dirty engine oil**			**butter**		
FH	**A**	**B**	**1**	**A**	**B**	**1**	**A**	**B**	**1**
5	22.7	25.5	26.4	16.0	23.1	19.3	14.4	17.8	19.2
20	23.8	23.1	26.3	17.9	19.5	19.6	17.9	12.1	23.2
35	22.6	22.3	23.1	22.7	15.2	27.1	20.8	12.9	20.5
50	21.3	21.0	21.7	22.8	16.6	23.1	18.0	9.9	20.5

It will be seen that the composition of the invention gives a robust performance across a wide range of water hardnessness.

Example 3 - Evaluation of laundry compositions: Removal of soil from knitted polyester

The test cloth used was knitted polyester of 10 cm x 10 cm in size.

The soil used was:

clay soil: yellow pottery clay suspended in demineralised water (10 % wt/wt).

The cloth was soiled with 0.5 ml of the soil.

Stain removal was assessed by washing the soiled test cloth with the detergent compositions given in Table 1 as described for Example 2 above.

Table 4: ΔΔE for stain removal from knitted polyester by Example 1 (according to the invention) and Comparative Examples A and B (not according to the invention).

	clay soil		
FH	A	B	1
5	35.3	32.7	32.5
20	34.9	30.6	36.7
35	32.9	28.3	34.1
50	31.8	27.8	33.3

It will be seen that the composition of the invention gives a robust performance across the range of water hardnessness.

CLAIMS

1. A laundry detergent composition comprising

(i) from 5 to 40 wt %, preferably from 7 to 30 wt %, of an anionic surfactant,

(ii) from 1 to 20 wt %, preferably from 1 to 10 wt %, most preferably from 2 to 6 wt % of a nonionic surfactant having a hydrophilic/lipophilic balance (HLB value) of from 13 to 25, preferably 15 to 22, most preferably 16 to 22,

(iii) optionally from 0 to 50 wt % of a cationic surfactant,

(iv) optionally from 0 to less than 10 wt % of a detergency builder,

(v) optionally from 0 to 60 wt % of at least one inorganic non-builder salt, and

(vi) optionally other detergent ingredients to 100 wt %.

2. A detergent composition as claimed in claim 1, wherein the nonionic surfactant (ii) is an alkoxylated alcohol nonionic surfactant.

3. A detergent composition as claimed in claim 2, wherein the alkoxylated alcohol nonionic surfactant has a hydrophilic/lipophilic balance (HLB value) of from 15 to 20, preferably 16 to 18.

4. A detergent composition as claimed in claim 1, wherein the nonionic surfactant (ii) is an ethoxylated alcohol nonionic surfactant of the general formula I

$$R - (- O - CH_2 - CH_2)_n - OH \qquad (I)$$

wherein R is a hydrocarbyl chain having from 8 to 16 carbon atoms, and the average degree of ethoxylation *n* is from 20 to 50.

5. A detergent composition as claimed in claim 4, wherein the ethoxylated alcohol nonionic surfactant has a hydrocarbyl chain containing from 10 to 16 carbon atoms, preferably from 12 to 15 carbon atoms.

6. A detergent composition as claimed in claim 4 or claim 5, wherein the ethoxylated alcohol nonionic surfactant has an average degree of ethoxylation *n* of from 25 to 40.

7. A detergent composition as claimed in any one of claims 4 to 6, wherein the ethoxylated alcohol nonionic surfactant has a hydrocarbyl chain containing from 10 to 16 carbon atoms and an average degree of ethoxylation *n* of from 25 to 40.

8. A detergent composition as claimed in any preceding claim, wherein the composition is free from nonionic surfactants other than the nonionic surfactant (ii).

9. A detergent composition as claimed in any preceding claim, wherein the anionic surfactant (i) is an anionic sulphonate or sulphate surfactant.

10. A detergent composition as claimed in claim 9, wherein the anionic surfactant (i) is linear alkylbenzene sulphonate.

11. A detergent composition as claimed in any preceding claim, wherein the weight ratio of the anionic surfactant (i) to the nonionic surfactant (ii) is within the range of from 1:1 to 15:1, preferably from 1:1 to 10:1, more preferably from 2:1 to 6:1.

12. A detergent composition as claimed in any preceding claim, wherein a cationic surfactant (iii) is present in an amount of from 0 to 50 wt %, preferably 5 to 40 wt %, most preferably 11 to 35 wt %.

13. A detergent composition as claimed in claim 12, wherein the cationic surfactant (iii) is a compound of the formula III:

$$R_1R_2R_3R_4N^+ X^- \qquad \text{(III)}$$

wherein R_1 is a C_8-C_{18} hydrocarbyl chain, typically an alkyl, hydroxyalkyl or ethoxylated alkyl group, optionally interrupted with a heteroatom or an ester or amide group; each of R_2, R_3 and R_4 (which may be the same or different) is a short-chain (C_1-C_3) alkyl or substituted alkyl group; and X is a solubilising anion, preferably a chloride, bromide or methosulphate ion.

14. A detergent composition as claimed in claim 13, wherein in the cationic surfactant (iii) R_1 is a C_8-C_{18} alkyl group, more preferably a C_8-C_{10} or C_{12}-C_{14} alkyl group, R_2 is a methyl group, and R_3 and R_4, which may be the same or different, are methyl or hydroxyethyl groups.

15. A detergent composition as claimed in any preceding claim, which is essentially free of detergency builder (iv).

16. A detergent composition as claimed in any preceding claim, wherein an inorganic non-builder salt (v) is present in an amount of from 1 to 40 wt %.

17. A detergent composition as claimed in claim 16, wherein the inorganic non-builder salt (v) is selected from the group consisting of sodium sulphate, sodium silicate, sodium chloride, calcium chloride and sodium bicarbonate.

18. A detergent composition as claimed in any preceding claim, which comprises one or more optional ingredients (vi) selected from soap, peroxyacid and persalt bleaches, bleach activators, sequestrants, cellulose ethers and esters, cellulosic polymers, other antiredeposition agents, fluorescers, photobleaches, polyvinyl pyrrolidone, other dye transfer inhibiting polymers, foam controllers, foam boosters, acrylic and acrylic/maleic polymers, proteases, lipases, cellulases, amylases, other detergent enzymes, citric acid, soil release polymers, fabric conditioning compounds, coloured speckles, and perfume.

19. A detergent composition as claimed in any preceding claim, which is in powder form.

20. A process for laundering textile fabrics by machine or hand, which includes the step of immersing the fabrics in a wash liquor comprising water in which a laundry detergent composition as claimed in any preceding claim is dissolved or dispersed.

21. Use of a nonionic surfactant having a hydrophilic/lipophilic balance (HLB value) of from 13 to 25, preferably 15 to 22, most preferably 16 to 22, to improve the stain removal of laundry detergent compositions comprising

(i) from 5 to 40 wt %, preferably from 7 to 30 wt %, of an anionic surfactant,

(ii) from 1 to 20, preferably from 1 to 10, most preferably from 2 to 6 wt % of the nonionic surfactant,

(iii) optionally from 0 to 50 wt % of a cationic surfactant,

(iv) optionally from 0 to less than 10 wt % of a detergency builder,

(v) optionally from 0 to 60 wt % of at least one inorganic non-builder salt, and

(vi) optionally other detergent ingredients to 100 wt %.

ABSTRACT

Laundry Treatment Composition

The detergent composition of the invention contains a combination of an anionic surfactant, a defined nonionic surfactant of high hydrophilic/lipophilic balance (HLB) value, optionally, a cationic surfactant, optionally a detergency builder and optionally at least one inorganic non-builder salt. Further optional detergent ingredients may also be present. The amount of the anionic surfactant is from 5 to 40, preferably from 7 to 30 wt % and the amount of the nonionic surfactant is from 1 to 10, preferably from 2 to 6 wt %, based on the weight of the total composition.